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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,074	02/25/2004	Katsuyuki Sekine	04329.3247	8935

22852 7590 02/07/2006

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EXAMINER
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BREWSTER, WILLIAM M

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 02/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/785,074

Applicant(s)

SEKINE ET AL.

Examiner

William M. Brewster

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 January 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-9, 12, 13, 15, 16, 18 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10, 11, 14, 17 and 19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 022504.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

Claims 1-9, 12, 13, 15, 16, 18, 20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 13 January 2006.

Applicant's election without traverse of claims 10, 11, 14, 17, 19 in the reply filed on 13 January 2006 is acknowledged.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 10, 11, 14, 17, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheng et al., US Patent No. 6,649,538 B1.

Cheng anticipates limitations from claim 10, a method of manufacturing a semiconductor device comprising: in col. 4, line 6 - col. 6, line 55,

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in fig. 2, forming a silicon oxide film 22 on a semiconductor region including silicon 20,  
col. 4, lines 6-13,

in fig. 2, heating the semiconductor region and silicon oxide film in a helium gas  
atmosphere, Steps 305, 307, col. 5, line 30 - col. 6, line 9; and

forming an insulating film including silicon, oxygen, nitrogen, and  
helium by nitriding the silicon oxide film;

limitations from claim 11, the method of manufacturing the semiconductor device  
according to claim 10, wherein heating the semiconductor region and the silicon  
oxide film in the helium atmosphere is performed so that helium is introduced into  
an interface portion between the semiconductor region and the silicon oxide film,  
fig. 2, Steps 305, 309, col. 5, line 30 - col. 6, line 9;

limitations from claim 14, the method of manufacturing the semiconductor device  
according to claim 10, wherein the silicon oxide film is nitrided by a plasma of a  
material including nitrogen, in fig. 2, Step 307, col. 4, line 56 - col. 5, line 29;

limitations from claim 17, the method of manufacturing the semiconductor device  
according to claim 10, wherein a film thickness of the silicon oxide film is not  
more than 2.5 nm: 5-30 Å, col. 4, lines 14-29;

limitations from claim 19, the method of manufacturing the semiconductor device  
according to claim 10, wherein a film thickness of the silicon oxide film is not  
more than 1.4 nm, 5-30 Å, col. 4, lines 14-29.

Cheng does not specify the Helium is introduced into the interface portion between the semiconductor region and the silicon oxide film or within the silicon oxynitride film. Nonetheless this is inherent due to the physics of diffusion. Proffered as evidence of the physics is Wolf, V. I, pp. 242-61. Wolf specifies the p. 245, Fick's Second Law of Diffusion (Eq. 18), p. 252, Table 2, Diffusion Coefficients of the Fast Diffusants in Silicon (Helium is of a size just larger than Hydrogen and smaller than the other diffusants) with diffusion coefficients, p. 260, Eq. (67) diffusion equation with diffusion constants. Using these formulae and charts the Helium diffusion may be calculated.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 571-272-1854. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink that reads "William M. Brewster". The signature is written in a cursive, flowing style.

2 February 2006  
WB

WILLIAM M. BREWSTER  
PRIMARY EXAMINER